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RESPONSE

Claims 6-24 are pending in this application with all claims being rejected under 35 usc 103(a) over Chan et al (u.s. 6,312,874) in view of Usami (u.s. 6,468,898). Reconsideration of this rejection is requested in light of the following remarks.

The present invention is directed to an improved mask structure for dual damascene fabrication of an interconnect structure in a low-k dielectric of an integrated circuit. The problem addressed is the lack of selectivity to etch plasma of conventional hard mask layers of silicon dioxide or silicon nitride. Accordingly, when vias or trenches are etched, there is poor feature transfer through the mask layer. Applicants have solved this problem of the prior art by creating a hard mask layer that is comprised of three films, a top one of which is a metal film of titanium or tantalum or alloys of these metals. The metal film has high selectivity to the etch plasma and enables formation of fine features through the mask layer. Each independent claim recites the metal film.

The examiner has cited Chan et al for its disclosure of a mask layer 58 comprising three films 52, 54 and 56. As described in Chan et al, films 52 and 56 are both silicon dioxide while film 54 is silicon nitride. Accordingly, the mask layer 58 will exhibit the same problem described by applicants as the problem to be solved, i.e., the films do not have the selectivity to plasma etching chemistry that will overcome poor feature transfer.

The examiner proposes to use Usami in combination with Chan et al to show that it would be obvious to substitute a metal film for one of the silicon dioxide films of Chan et al. Usami discloses the use of a metal mask film over a silicon dioxide film for an entirely different purpose. Usami is using an organic dielectric and has a problem with dielectric contamination from carbon in the photoresist ash after a trench or via has been etched in the dielectric. In order to overcome the contamination problem, Usami proposes to create a metal mask that can be etched using a photoresist in a conventional etch process with an

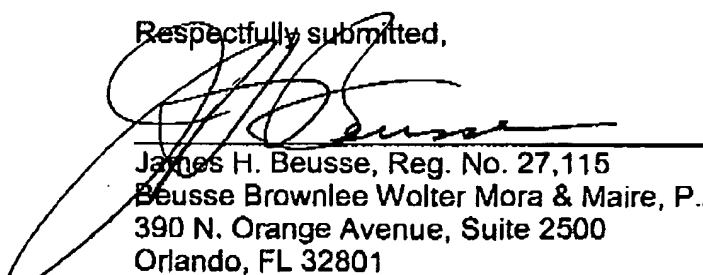
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etchant that is highly selective to silicon dioxide so that the metal film is etched down to the silicon dioxide film which continues to protect the underlying dielectric. The photoresist is then removed by conventional means and the metal mask is then used as the mask for the next etch step through the silicon dioxide and dielectric. Essentially, Usami discloses the use of a metal mask to replace the photoresist mask for an etch step. There is no suggestion in Usami that the metal mask could be used to improve etch definition in a low-k dielectric process.

As the examiner is well aware, there must be some teaching or suggestion in the cited references that would lead one to combine them in the form set forth in the present application. Applicants' submit that there is no such suggestion in either of Chan et al or Usami. Had it been obvious, Chan et al would have suggested using a metal layer but none is mentioned. Usami is attempting to solve an entirely different and unrelated problem. Accordingly, a person of ordinary skill in the art would not read Usami and perceive that a metal layer could be applied in a multi-film mask to solve a feature definition problem. Metal layers are commonly deposited in formation of integrated circuits and the mere suggestion that a metal layer could be deposited over a silicon dioxide layer is not a suggestion that a metal film could be used to enhance feature definition in an etch process for a low-k dielectric. Accordingly, it is submitted that there is no teaching or suggestion in the cited references that would lead one to make the combination as set forth in Applicants' claims.

For the reasons set forth above, it is believed that applicants' claims are in condition for allowance and such allowance is solicited.

Respectfully submitted,



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CERTIFICATE OF TRANSMISSION

I HEREBY CERTIFY that this Amendment is being FAXED to the U.S. Patent Office at 703-872-9306 (Central Fax Number) on this 14th day of July, 2005.


James H. Beusse